September 23, 1991

Note to: Beth Brown

From: Dean Neptune

Re: Review of Collierville Site

As you requested, the Collierville draft Remedial Investigation Report was reviewed and the following comments are presented for your consideration. If you have any questions please give me a call and we can work through your issues.

NATURE AND EXTENT OF CONTAMINATION ON THE COLLIERVILLE SITE

The primary stated objective of the Remedial Investigation was to "identify and confirm the nature and extent of TCE contamination at the Collierville site." (p. iii) This statement is somewhat refined on page 102 which states that the objective of the RI Sampling Plan is "to determine the nature and extent of contamination in site soils and groundwater." From our initial review of the RI materials, we feel that these objectives were not fully met, especially for soils, in a defensible manner.

Excluding three background wells, almost all the sampling focused on the two known contaminated areas. The sludge area contamination was somewhat of a surprise and suggests that other site areas may also yield surprises. While contamination and migration of contaminants from three release sites was verified, from what we can tell the entire site did not have a known and positive probability of being sampled, which we feel would be needed to meet the objective as stated. Therefore, we are left without data that can be extrapolated to the site to support a conclusion that the problem has been adequately characterized.

No further discussion of the rationale for the sampling plan is presented beyond the statement that borings are "strategically placed" (p.iii and 102). The sampling plan appears neither random nor systematic, but judgement based (sometimes referred to as haphazard or biased sampling). As you are well aware, one cannot readily extrapolate beyond the borings themselves in a statistically valid manner (with known confidence) using a plan of this type. While there is some scattered discussion of the rationale for placement of specific monitoring wells, the big picture which would explain why wells were placed where they were is not apparent.

Listed below are some examples of the type of rationale we found in the RI:

      "None of the well installations in the RI study were placed in areas suspected or found to have high concentrations of contaminated soils during drilling." (p.37)

      "Deep wells penetrating the Jackson Formation clay were designed to minimize the potential for cross contamination from the shallow aquifer." (p.39)

      "At seven locations a shallow and deep well have been nested or installed adjacent to one another in order to investigate differences in characteristics with depth." (p.104)

"Well nest MW-3 and MW-4 were initially installed for use as upgradient wells....during the investigation, it was found that MW-3 was actually downgradient of the areas were TCE spills had occurred."

All told, 28 wells were installed at the Collierville site. With this network, and a general understanding of the site hydrogeology, the nature and extent of the ground water problem is probably better understood then the location of the soil sources. Unfortunately, their is still no way to calculate the uncertainty associated with the groundwater conclusions.

IMPOUNDMENT SITE

It is never clarified why TCE was found in the impoundment site with the zinc phosphate sludge and/or if it was expected to be found there. If expected, what activities on the site associates zinc phosphate with TCE? If it was not expected, is it not possible significant levels of TCE can be found elsewhere on the site? "The possibility of additional areas of contamination were considered during the investigation but no additional source areas were defined." (p.102) No reason was given for what possible additional locations existed, nor why none were defined.

There are ambiguities concerning the location of what they refer to as the former surface impoundment in relation to what they refer to as the former lagoon area. Is there a connection between the two? Is the impoundment site a small area within the lagoon area?

The RI states that "although zinc phosphate has been used on the Site and placed in the former surface impoundment, the data do not show a pattern of lead or zinc in association with TCE source areas nor is a pattern of contamination present." (p.85) The impoundment, however, has been found to be contaminated with TCE. Additionally it is noted that average lead and zinc values decrease with depth in virtually all site soils except the former lagoon area. (p.85) Because TCE contamination is found in zinc phosphate storage areas, the case that TCE and zinc are not associated should be clarified before zinc soil concentrations are attributed to diverse anthropogenic sources unrelated to the TCE releases on site" in the lagoon area. See p.85,94,97.

In section 5.5.3 it is stated the old lagoon area may be a potential source of zinc due to the use of zinc phosphate on the Site and the discharge of zinc phosphate sludge into the lagoon.(p.138) Is the old lagoon the impoundment site? On page 210 it is stated that TCE is found in greatest concentrations in two areas, one being the northwest portion which is also called the former lagoon area. The release site in Chapter 1 is described as a 50' by 48' waste water surface impoundment. (p.12) In the hydrogeologic parameters table (p.215) the lagoon area is defined as 20 acres. What is contaminated; the full 20 acres, or simply the impoundment site in the lagoon area?

SOIL GAS SURVEY

The map on page 128 gives the impression that the boundaries of the soil contamination are well defined, yet no explanation of the basis for the isopleths is given. The RI states that a soil gas survey was performed to delineate the dimensions of the TCE affected soils in the former sludge area (p.128) using B-17 as the grid center point for the survey (the highest TCE contamination found). From the RI it appears that the soil gas survey was confined to the impoundment area (i.e. a release site), however, the grid points established for the soil-gas survey are not documented and do not appear on any map.

Furthermore. the results of the soil gas survey are not included in the appendices. The RI reports that soil gas survey results "allowed the location of the impoundment to be further defined" (p. 134). This statement qualifies what it means to have a location "firmly established." (p.12)

Additional questions/issues not addressed in the RI report

What is the probability that a given concentration in excess of the isopleth line exists outside the line (p.128)? What risk impact would this have on the direct exposure to soil and to groundwater?

Have the isopleths captured the boundary of unacceptable PCE contamination Region IV wishes to use as a cutpoint for surface and subsurface?

Ensafe calculated three acceptable soil concentrations based on groundwater; does Region IV wish to use all three; or to select the most conservative value?

How were individual well locations determined from the results of the soil gas survey? (p. 146)

What is the probability that other yet to be found disposal areas exist on the site?

AVERAGING SOIL DATA FROM VARYING DEPTHS AND LOCATIONS

What data were used?

Surface and five feet down for the soil/sediment pathway. "The average value of each contaminant from the upper five feet of soil was used to assess risk. This value was used in order to provide a representative assessment of the Upper Bound Risk Level as it is unreasonable to expect contact with soils beneath five feet during normal occupational or residential activities." (p. 211)

To estimate acceptable surface soil clean up for groundwater protection, current average concentrations in the surface soil compartment and average concentrations in the deep soil compartment were compared. (p.218) This approach is the Summers method for calculating the soil cleanup levels. The model subdivides soil into discrete layers or compartments and calculates the leaching of contaminants out of each compartment. (p.212)

Risk calculations for direct ingestion/dermal contact were performed using mean values for COCs in the upper five feet of soil. (p. 207) "The remediation of surface and deep soils is not necessary to reduce the total risk from direct exposure (ingestion or dermal contact) to all site soil contaminants as the present levels are insignificant." (p.227) (Hence indirect exposure to groundwater should drive the level to which soil must be remediated.)

Is it inappropriate to average data from a judgement based sample taken across the site when estimating risk?

Glen
already
commented

Under the soil/sediment pathway arithmetic averages of COC concentrations site wide were used. (p.207) This handling of the data is only partially consistent with RAGS which indicates that UCLs should be used. The RI states UCLs were not calculated because "data were not

normal" but this should have been a forgone conclusion, since samples were taken in a non-random, biased manner. By averaging hits and misses across the site, the implicit assumption is that people will be exposed to an average of all sampled locations. This assumption, for a 135 acre site, is probably not valid. At least, data should be averaged over smaller areas which correspond to exposure patterns. At best, the size of these areas should be specified upfront and samples taken in a statistically defensible manner from all such units.

Are exposure pathways considered?

Yes, three exposure scenarios were described as follows:

Ingestion of and dermal contact with contaminated soil by on-site workers, trespassers (e.g. children) and hypothetical on-site residents

Ingestion of and dermal contact with contaminated groundwater from Memphis Sands aquifer by hypothetical and current residents

Inhalation of chemical vapors from contaminated groundwater during showering by hypothetical and current residents

Questions concerning calculations appearing in Tables 4-5 through 4-11 and Tables 8-1 through 8-6. See p.86-92 and 187-91.

How is the mean concentration estimated?

What depths are averaged for mean and range calculations?

GENERAL COMMENTS ON INCONSISTENCIES OR AMBIGUOUS LANGUAGE:

Figure 3-1
Boring 40 appears to be mislabeled as B-18.

p. 52 Phase III, 4th line
How many shallow wells?

p. 68-74
The term "generally good" is used repeatedly throughout the sections on data quality including precision, accuracy, inorganic data quality and blank analysis. This has no real meaning.

p. 68
Data quality is "judged good and acceptable" yet no mention is made of evaluation criteria.

p. 74
Methylene chloride, carbon disulfide acetone and 2-hexanone were the most frequent volatile compounds identified in field and rinsate blanks. They were attributed to laboratory artifacts with no discussion except for what appeared on p. 84; "no site conditions which would explain the existence of these compounds."

p. 103
"Initially 48 soil borings were installed near each of the three potential source sites."

p. 26
"Previous investigations at the Site had resulted in the installation of 55 soil borings."
Both may be correct but need to be clarified in some way. This is often the case in this document in reference to additional and existing borings at various times in the investigation.

p. 133 line 4
Table 5-3, not 5-2.
Also, data for B-40 does not appear in Appendix I.

p. 125 last line
1.0 ft/ft?